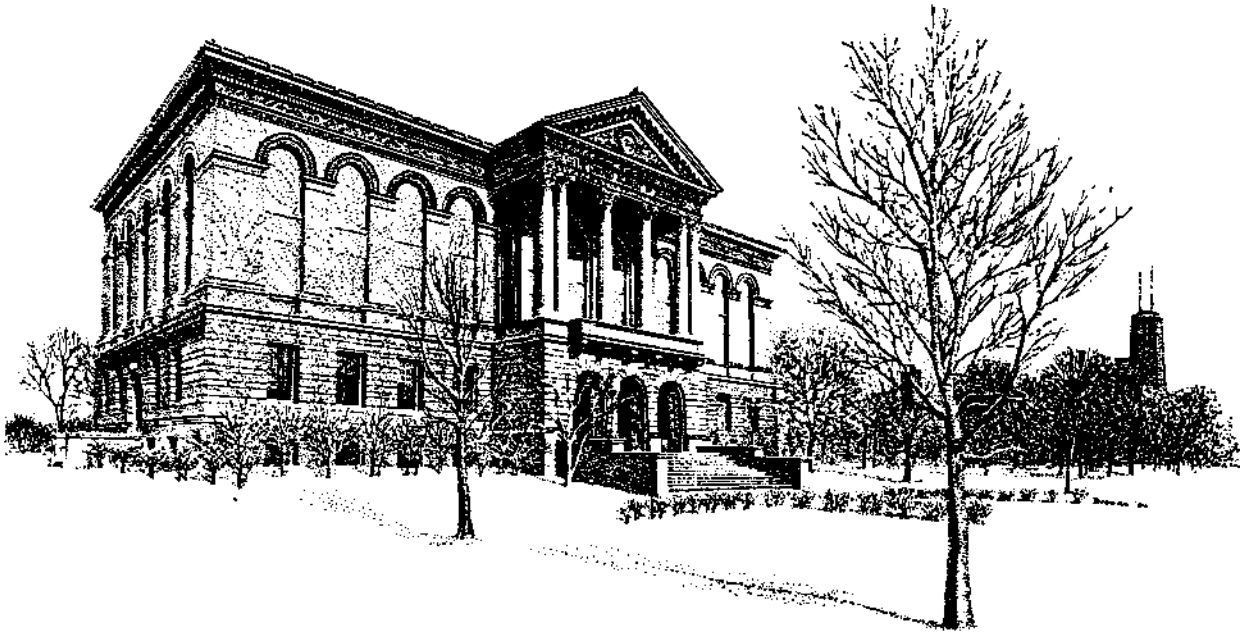

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No. 1: Fishes of the Guyandotte River, West Virginia. Stauffer, Denoncourt, Hocutt and Miles
No. 2: A Description of the Cyprinid Fish Hybrid, *Clinostomus elongatus x Notropis cornutus.* Boltz, Stauffer and Boltz

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FISHES OF THE GUYANDOTTE RIVER, WEST VIRGINIA

Jay R. Stauffer, Jr.[1], Robert F. Denoncourt[2],

Charles H. Hocutt[3], and Robert L. Miles[4] *

INTRODUCTION

The Guyandotte River rises in southern Raleigh County near Rhode11, WV and flows west for approximately 240 km to Gilbert, where it turns north and flows 185 km to its confluence with the Ohio River near Huntington, WV (Reed 1974). It drains a major coal producing area which has an estimated 6.3 x 10^9 metric tons of recoverable coal (Anonymous 1974). R. D. Bailey Lake, an Army Corps of Engineers impoundment located on the main-channel near Justice, WV was filled during 1980.

During the Pliocene, the Guyandotte River was a tributary of the ancestral Teays River, with its course similar to its present day one (Tight 1983: In Hocutt et al. 1978). As the Pleistocene proceeded, the Guyandotte River and the Big Sandy followed the outflow of Teays Lake to become part of the expanding Ohio River (Hocutt et al. 1978).

Jenkins et al. (1972) aligned the fauna of the Guyandotte River with those of the Little Kanawha, Kanawha and Big Sandy river systems. However, they indicated that the fauna of the Guyandotte River is relatively depauperate when compared to the others, but suggested this may be related to incomplete assessment. The purpose of this paper is to synthesize known information concerning the fishes of the Guyandotte River and report a series of collections made in 1975.

Materials and Methods

Fishes were collected throughout the Guyandotte River drainage during the summer of 1975, utilizing a 1.3 x 3.3 m, 3.6 mm mesh nylon seine and an AC/DC electroshocker (Table 1; Figure 1). Specimens were collected until it was determined that further effort would yield no additional species (Hocutt et al. 1974). All specimens were preserved in 10% formalin, stored in 40% isopropanol and placed in permanent storage in the Fish Museum, Appalachian Environmental Laboratory, University of Maryland, Frostburg, Maryland. Nomenclature followed Bailey et al. 1970.

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Figure 1. Map of the Guyandotte River showing collection localities for 1975.

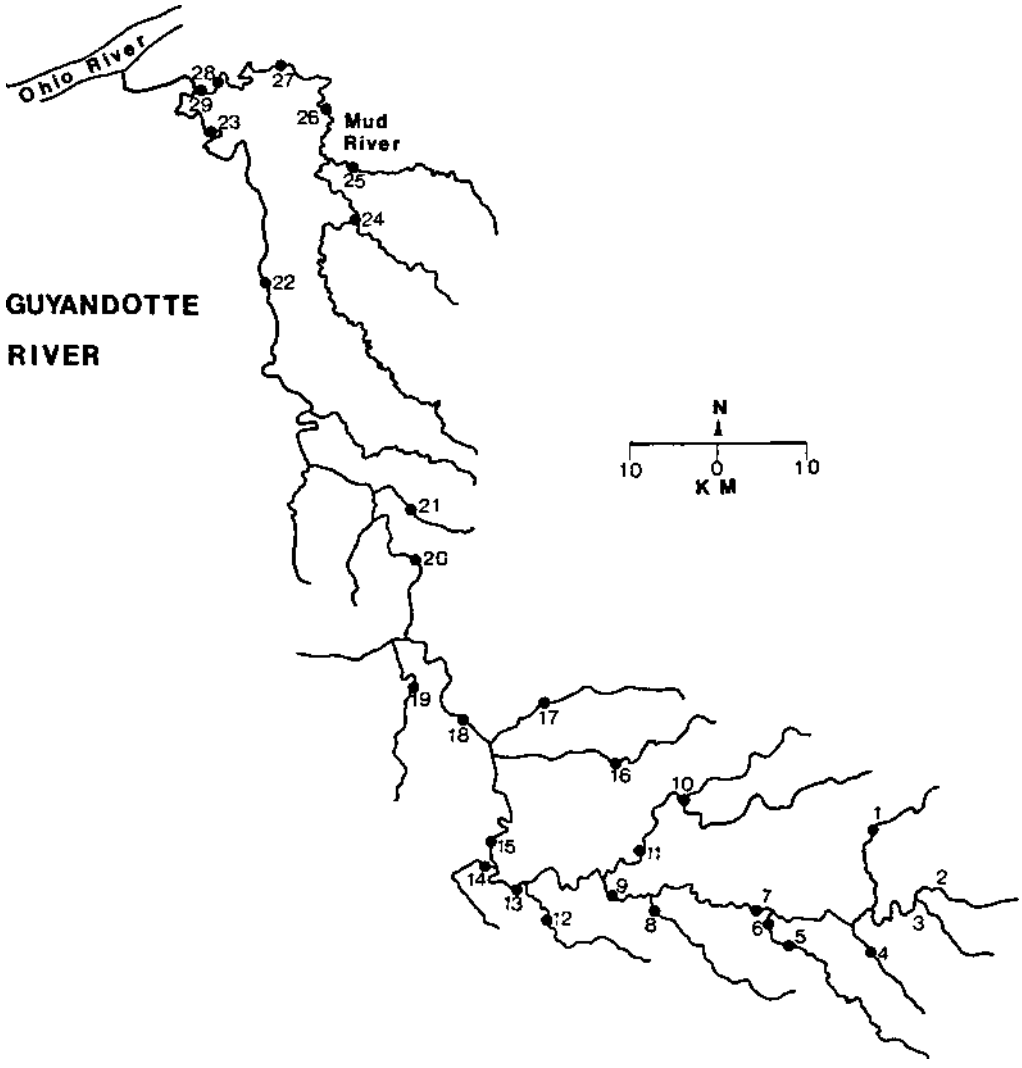

Table 1. List of collection localities in the Guyandotte River, West Virginia during 1975.

1. Slab Fork Creek, Route 54 bridge, approximately 13 km above Mullens, WV
2. Tommy Creek, Route 16 bridge at Stone Coat Junction.
3. Guyandotte River at Route 16 bridge, Allen Junction.
4. South branch of Guyandotte River above, below, and including Milan Fork, 8 road kilometers above junction of Routes 10 and 16.
5. Pinnacle Creek, 4.9 road km above junction of Route 16 Pinnacle Creek Road.
6. Pinnacle Creek along Pinnacle Creek Road upstream from Route 16, southeast of Pineville.
7. Guyandotte River at mouth of Pinnacle Creek at Route 16 bridge.
8. Indian Creek, 0.4 road km below Fanrock, WV.
9. Guyandotte River, approximately 4.8 km west of Baileysville.
10. Confluence of Laurel and Huff Creeks, Oceana, WV.
11. Clear Creek along Route 7, upstream of junction of Routes 7 and 9.
12. Little Huff Creek south of Route 52, east of Baileysville on Routes 52 and 80.
13. Guyandotte River above and below Route 80 bridge at Justice, WV.
14. Gilbert Creek above Gilbert High School along Route 52.
15. Guyandotte River below Route 80 bridge at Tamcliff, WV.
16. Huff Creek, 1.6 road km west of Cyclone, WV. on Route 10.
17. Buffalo Creek northeast of Man, WV.
18. Guyandotte River along Routes 10 and 80, ca. 8 road km north (downstream) of Man, WV.
19. Island Creek just upstream from Mico, WV.
20. Guyandotte River and tributary at Peck's Mill, above and below Route 10 bridge.
21. Big Creek at Big Creek Road bridge, ca. 3.2 air km east of Chapmanville, WV.
22. Guyandotte River, below Route 10 bridge at Branchland, WV.
23. Guyandotte River, Route 10 bridge south of Barboursville at Salt Rock, WV.
24. Confluence of Mud and Middle Forks.
25. Trace Fork of Mud River on Trace Fork Road, 1.6 km from junction of Route 34.
26. Mud River, 4.8 air km south of Milton, WV.
27. Mud River at Howell's Mill, WV.
28. Mud River along Route 60, ca. 1.6 km above mouth.
29. Mud River at mouth**.**

Results and Discussion

A total of 10,518 specimens representing 55 species was collected during the 1975 survey (Table 2). Electroshocking and rotenone surveys conducted by the West Virginia Department of Natural Resources (WVDNR) produced 10 species which were not collected. Jenkins et al. (1972) reported 44 species from the drainage and one species, *Moxostoma carinatum*, which was not collected during either of the above surveys. A fisherman added one record to the drainage with his catch of *Polyodon spathula. Micropterus salmoides, Esox lucius* x *Esox masquinongy* and *Morone chrysops* x *Morone saxatalis* were recently stocked in the R. D. Bailey Lake; and *Salmo gairdneri, Salmo trutta* and *Salvelinus fontinalis* are stocked in the tributaries, bringing the total know species to 71.

Pinnacle Creek, a small headwater tributary creek represented by stations 5 and 6, should be noted for its relative high diversity (24 species). The stream provides good habitat for a variety of species as evidenced by the fact that it yielded more species than the main-channel stations immediately downstream of its mouth. It is also routinely stocked with salmonids by the WVDNR. Another tributary which yielded an extremely high number of species *is* Mud River. Mud River flows into the Guyandotte near the Guyandotte's confluence with the Ohio River. A total of 42 species is known from the sub-drainage. The high diversity of Mud River may be related to: (1) close proximity to the Ohio River; (2) low gradient which allows fish easy access; and (3) Mud River now occupies the channel of the ancestral Teays River.

Annotated Species List

The discussion of species in this survey is supplemented by surveys of the West Virginia Department of Natural Resources (WVDNR), literature review, and museum visits. Species reported herein are new records or species not collected during the 1975 survey.

Petromyzontidae

Lampetra aepyptera. - The least brook lamprey was collected at one station on the main-channel and in the Trace Fork of Mud River. These specimens represent the first records in the drainage.

Polyodontidae

Polyodon spathula. - The paddlefish was not collected in the 1975 survey; however, a fisherman caught one specimen in the main-channel near Justice, WV on 29 May 1978. This specimen represented the first confirmed record from the drainage.

Lepisosteidae

Lepisostens osseus. - The longnose gar was collected in the main-channel north of Man, WV and near the mouth of Mud River. These specimens are the first records reported from the drainage.

Clupeidae

Dorosoma cepedianum. - Two specimens were captured near the mouth of Mud River, which represent the first records from the drainage.

Salmonidae

Salmo gairdneri, Salmo trutta, and *Salvelinus fontinalis are* routinely stocked in selected tributaries of the Guyandotte River by the WVDNR. Although none were collected during this survey native brook trout populations were certainly present in portions of the drainage at one time.

Esocidae

Esox masquinongy. - One specimen was collected by the WVDNR in Mud River,

38 km above the mouth near Milton, WV which was the first record from the drainage. Muskellunge have been routinely stocked in Mud River since 1964. In addition, tiger muskies, *Esox lucius* x *E . masquinongy, are* stocked in R. D. Bailey Lake.

Hybopsis aestivalis. - Collections of speckled chub at six stations represent the first records from the drainage. Jenkins et al. (1972) reported it as being native to the Kanawha River, so its presence in the Guyandotte River was expected.

Notropis atherinoides. - During the 1975 survey, the emerald shiner was taken only from Mud River. However, it is surely present in the lower reaches of the main-channel where water depth prohibited seining. These specimens represent the first records from the drainage; although its presence was expected since it is native to both the Kanawha and Big Sandy rivers (Jenkins et al. 1972).

Phoxinus erthrogaster. - The southern redbelly dace was found only in Mud River (Stations 25 and 27). These specimens are the first reports of this species from the drainage. Jenkins et al. (1972) list it as native from the Kanawha and Big Sandy rivers.

Catostomidae

Carpiodes velifer. - One specimen, representing a new record for the drainage, was collected in the main-channel at Tamcliff, WV Jenkins et al. (1972) report it from both the Kanawha and Big Sandy rivers. *Ictiobus bubalus.* - The smallmouth buffalo was not collected in 1975, however, the WVDNR collected one specimen at the mouth of Guyandotte River with an electroshocker on 13 July 1978.

Minytrema melanops. - The spotted sucker was not collected during the 1975 survey. However, it was reported from Mud River near Milton, WV by the WVDNR.

Moxostoma anisurum. - Although not collected in 1975, the WVDNR collected the silver redhorse in Mud River and in the main-channel 217 km and 226 km above the mouth. These specimens were the first reports of this species in the drainage. Jenkins et al. (1972) report it from both the Kanawha and Big Sandy rivers.

Mosostoma carinatum. - No specimens of the river redhorse were collected in the 1975 survey or by the WVDNR. Jenkins et al. (1972) list it as being native to the drainage, and also reports it from the Kanawha and Big Sandy rivers.

Mosostoma duquesnei. - The WVDNR collected the black redhorse from the main-channel 217 km above the mouth.

Mosostoma macrolepidotum breviceps. - One specimen was collected in the main-channel at Justice, WV (Station 13), which is the first record from the drainage.

Ictaluridae

Ictalurus natalis. - One specimen was collected in the main-channel near Peck's Mill, WV (Station 20) during the 1975 survey. Another yellow bullhead was taken in Trace Fork of Mud River by the WVDNR. These specimens are the first records from the drainage. Jenkins et al. (1972) list it as native from both the Kanawha and Big Sandy rivers.

Noturus flavus. - Specimens of the stonecat, representing the first records from the drainage were collected in the main channel near Branchland, WV (Station 22) and in Mud River approximately 1.6 km above the mouth (Station 29). Jenkins et al. (1972) report it from the Big Sandy river.

Pylodictus olivaris. - The first specimens of flathead catfish collected from the drainage were taken in the

Table 2. Fishes collected from the Guyandotte River, West Virginia during 1975.

	1	2	3	4	5	6	7	8	9	10	11	12
Lampetra aepyptera												
Lepisosteus osseus												
Dorosoma cepedianum												
Campostoma anomalum	4			3	2	3	6	10	2	8	33	1
Cyprinus carpio												
Ericymba buccata					7		1	4		50		156
Hybopsis aestivalis												
Nocomis micropogon								6				
Notropis atherinoides												
Notropis blennius												
Notropis chrysocephalus	1		1		29	24	14	56	1	1	2	8
Notropis photogenis		9			17	1	1	34				
Notropis rubellus			3		136	148	298	76	78	87	28	14
Notropis spilopterus									11	3		2
Notropis stramineus					1	3	14		4	17	24	50
Notropis umbratilus												
Notropis volucellus							2		2			
Notropis whipplei									4	5		
Phenacobius mirabilus							2					
Phoxinus erythrogaster												
Pimephales notatus					132	56	53	56	1	11	22	47
Rhinichthys atratulus	22	87	1	20	2			2			1	18
Semotilus atromaculatus	26	230	8	40	18	2	54	8	8	23	9	53
Carpiodes cyprinus												
Carpiodes velifer												
Catostomus commersoni	3	3	7	2	10	2	19	11		5		5
Hypentelium nigricans	3	10	13	4	1	6	11	15	1	6	1	9
Moxostoma erythrurum				1	1							
Moxostoma macrolepidotum breviceps												
Ictalurus natalis												
Ictalurus punctatus												
Noturus flavus												
Noturus miurus												
Pylodictus olivaris												
Percopsis omiscomaycus												
Ambloplites rupestris			1			1	3	2		2	3	
Lepomis cyanellus	2								4	1	1	
Lepomis macrochirus												
Lepomis megalotis						1						2
Micropterus punctatus					3		2	1	2	3	1	1
Pomoxis annularis												
Ammocrypta pellucida												
Etheostoma blennioides					22	21	9	30	1	3	12	6
Etheostoma caeruleum		1	2	2	22	40		16			5	6
Etheostoma flabellare				1				4				
Etheostoma nigrum	27				12	14		16				41
Etheostoma variatum					30	33	10	19		7	5	
Etheostoma zonale					8	49	30	30	14			
Percina caprodes				3	2	9	8	2				
Percina copelandi												
Percina maculata					4	2		3			8	2
Percina oxyrhyncha					2	4	1	1			1	
Percina sciera												
Stizostedion vitreum												
Cottus bairdi	7				1							
	95	340	36	76	462	419	538	402	133	232	156	422

Table 2. Continued.

13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
												17				
					1											1
																2
18	1	4	19	N	1	9	36	2	6	4		18	29	63	17	32
							5							2		
4	60	8	11			33	60	171	49	5	7	9	5	28	38	1
3		17		0	21		5		2						7	
		1	10										13	7	3	
														3	21	
										7					1	1
			10		1	3	30	37	58	126	65	102	19	19	6	1482
1							5		1							1
	6	113			18				3				12	4	1	
33	12	88	1	F	110	1	77	3	59	63				3	66	126
39	2	296			140	66	38		30	25	7	7	8	2	7	11
				1								19		18		
	4	7			4				1				2		32	4
13	1	103		S	69		54		56	19					75	23
4		28			12	2	5		2							8
												1		1		
1	5	39	2	H	3	7	11	32	28	7	3	30	24	31	30	10
6	34	2	33			62	10	2	1			1	2	1	8	
	14	1	33			34	293	88	15	4	13	33	21	29	40	55
										1						
	2					2	33	12	2			5	2	1	4	1
6	1	3	4			6	47	2	1	1	3	11	4	1	6	
												12				
1																
							1									
		13			5				1	1						
									1						2	
															5	
		6													2	
												3	7			4
												2	2	1		
								1				4			1	
												3	1	3		1
				N				4				7	2	1	3	2
1		2							1		2	1	1	7	1	10
				0										3		
													1		1	
4		5					4		1			6	9	6	10	
			7		1											
			9									9	7		12	
1				F				11	1		3	34	16	23	7	32
13		106			29	2	9		12	1					4	
19		123		I	38		101		6			2	24	22	7	
4		5			1							1		3	2	
4		1		S	4											
1		3							1		2	4	11	1	5	
		4		H	1		5									
		4			10		1		11	1			1		4	
																2
220	142	983	139		170	227	830	365	349	265	105	341	223	283	428	1837

main-channel at Tamcliff, WV (Station 15) and in Mud River approximately 1.6 km above the mouth (Station 28). It is listed as native to both the Kanawha and Big Sandy river by Jenkins et al. (1972).

Atherinidae

Labidesthes sicculus. - Brook silversides were not collected in 1975, but the WVDNR reported them from Mud River below Milton, WV and at Howell's Mill.

Centrarchidae

Micropterus dolomieui. - No smallmouth bass were taken in the 1975 survey. However, the WVDNR has collected 12 throughout the drainage in rotenone and electrofishing collections. They have been stocked in R. D. Bailey Lake.

Micropterus salmoides. - There are no verified collections of the largemouth bass from the drainage; however, the WVDNR has stocked it in R. D. Bailey Lake.

Pomoxis annularis. - Three specimens of the white crappie were collected from Mud River at Howell's Mill (Station 27). These represent the first records from the drainage.

Pomoxis nigromaculatus. - Although not collected in the 1975 survey, black crappie were stocked in the upper Guyandotte River in 1966. Surveys conducted by the WVDNR during 1980 show that it is established in R. D. Bailey Lake.

Percidae

Ammocrypta pellucida. - The eastern sand darter was collected at two localities (Station 26 and 28) in Mud River. The WVDNR also collected 17 specimens in Mud River near Milton, WV The above represent the first records from the drainage. Jenkins et al. (1972) list them from the Kanawha and Big Sandy rivers.

Etheostoma variatum. - The variegate darter was present at 13 stations. These collections are the first records from the Guyandotte River. Jenkins et al. (1972) report it from the Kanawha and Big Sandy rivers.

Percina oxyrhyncha. - Collections of the sharpnose darter at eight stations are the first records from the drainage. This species has been previously reported as *Percina phoxocephala* (Jenkins et al. 1972), which is not known from the state.

Stizostedion canadense. - WVDNR electrofishing collections have yielded several specimens during 1978 and 1979 in the lower reaches of the main-channel. These are the first records reported from the drainage.

Sciaenidae

Aplodinotus grunniens. - The freshwater drum was not collected in 1975, however, the WVDNR collected one specimen at the mouth of the Guyandotte River with an electroshocker on 13 July 1978.

Expected Species.

The following species were not collected by us, nor could their presence be verified through literature reviews or museum searches; however, based on their known distribution (Lee et al. 1980) they could reasonably be expected to occur in the Guyandotte River drainage. It should be noted that due to gear restrictions, the lower deeper sections of the main-channel could not be adequately sampled. Following are species which Jenkins et al. (1972) list as native from either the Kanawha or Big Sandy River, or both, and are therefore expected: *Ichthyomyzon bdellium, Anguilla rostrata, Alosa chrysochloris, Hybopsis amblops, Hybopsis dissimilis, Carpiodes carpio,* and *Ictiobus niger.* Additionally *Notropis dorsalis* is present in the main-channel Ohio River and in the Little Kanawha River, therefore its presence in the Guyandotte River could be expected. Finally, unverified records of *Ictalurus melas* from the Guyandotte River by the WVDNR suggests the *I. nebulosus* probably occurs in the drainage. The presence of *I. melas* anywhere in the upper Ohio basin is doubtful (R. Taylor, Pers. Comm.).

Conclusion

Based on collections by us, the WVDNR, literature reviews, and museum visits, there are 71 species known to occur in the Guyandotte River drainage. There are an additional eleven species expected.

Mud River, a small tributary near the mouth, harbors 42 species. The data presented herein established 24 new distributional records for the drainage.

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A DESCRIPTION OF THE CYPRINID FISH HYBRID,

Clinostomus elongatus x Notropis cornutus

Jeffrey M. Boltz, Jay R. Stauffer, Jr., Suzanne E. Boltz*

INTRODUCTION

The spawning habits of the common shiner, *Notropis cornutus* (Mitchill), are well documented (Raney, 1940). Once considered subspecifically distinct from the closely related *Notropis chrysocephalus*, Gilbert (1964) elevated the two taxa to species level. While some have contested Gilbert's (1964) classification (Menzel, 1976; Miller, 1968), it is currently accepted (Robins et al., 1980; Dowling and Moore, 1984). Life history aspects of the redside dace, *Clinostomus elongatus* (Kirkland), are documented by Koster (1939). Hybridization between *N. cornutus* and C. *elongatus* is common (Greene, 1935; Greeley, 1938; Koster, 1939; and Raney, 1940; Schwartz, 1981), but no description has been published.

Koster (1939) observed *N. cornutus* and C. *elongatus* spawning at the same time over the same nests of other minnows, and recorded them as spawning from late May until the first week of June, when occurrences of spawning began to decline. Raney (1940) reported similar spawning dates for *N. cornutus.* Both species are known to spawn over the nests of other fishes, such as *Nocomis micropogon.*

A survey of the fishes of Crooked Creek in the Allegheny River system yielded several specimens which we hypothesized to be hybrids between *N. cornutus* and C. *elongatus.* Both of the parental species are found throughout the Allegheny River system. The purposes of this paper are to provide morphometric, meristic, and descriptive analyses of these specimens. Through these analyses we can determine the parental forms and provide data needed to identify these forms.

MATERIALS AND METHODS

The fishes used were collected in the Allegheny River system in 1980 by Edwin L. Cooper and in 1985 by us, and are stored in The Pennsylvania State University Fish Museum. Morphometric and meristic characters were determined by methods outlined by Hubbs and Lagler (1964). Measurements were made with dial calipers to the nearest 0.1 mm. The mean of each character was determined for each parental species and compared to the mean hybrid value. A hybrid index was then calculated following Hubbs, Hubbs, and Johnson (1943):

$$H\ (X_h - U_1/U_2 - U_1) \times 100$$

where H is the hybrid index, X_h is the hybrid value, U_1 is the value for *C. elongatus,* and U_2 is the value for *N. cornutus.* A hybrid index of 50 indicates exact intermediacy; an index value greater than fifty indicates closer affinity to *N. cornutus;* and an index of less than fifty indicates closer affinity to *C. elongatus.* The characters chosen for the hybrid index were significantly different ($P < 0.05$) between *C. elongatus* and *N. cornutus as* shown by the Wilcoxon Rank Sum Test.

RESULTS

Table 1 summarizes data for the 14 morphometric and meristic characters used in the analysis. The following characters are intermediate (hybrid index between 30 and 70): number of lateral-line scales, scales

* Hybrid shares certain characteristics of the parental species

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below the lateral line, predorsal length, pectoral-fm length, and snout length. Three characters are closer to the mean value for *N. cornutus* and six are closer to the mean value for C. *elongatus.* The mean values of five characters are outside the means for either parent. The development of these latter character states is attributed to luxuriance or hybrid vigor (e.g. Mayr, 1971). The following characters were examined but were not significally ($P < .05$) different between the parental species: postorbital head length, caudal peduncle depth, caudal peduncle length, and anal, dorsal, pelvic, pectoral-fin rays. The average hybrid index for all characters that were within the range of the parental species is 36.9. When all characters are averaged the hybrid index is 51.7. Since there was individual variation among the hybrids, the hybrid value was calculated for each individual using all of the characters. The individual hybrid indices ranged from 54.3 –70. 7, x = 59.4.

The hybrids are clearly intermediate, although there is moderate variation among individual hybrids (Table 1). The hybrids were determined to be C. *elongatus* x *N. cornutus* rather than C. *elongatus* x *N. chrysocephalus* based on the scale pattern between the head and dorsal fm (i.e. see Gilbert 1964, Cooper 1983). *N. cornutus in* the Allegheny River system has crowded and poorly defined scales in the area between the head and dorsal fin, whereas those of *N. chrysocephalus are* uncrowded and well defined. This hybrid identification is also supported by the fact that no *N. chrysocephalus* were collected in this area.

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Table 1. Comparison of morphometric and meristic characteristics of the hybrid *Notropis cornutus* x *Clinostomus elongatus* with its putative parents.

Character	*C. elongatus* n = 10		*N. cornutus* n = 10		Hybrid n = 4		Hybrid Index
	Range	X	Range	X	Range	X	X
Standard Length	58.2-66.35	61.46	49.2-70.8	60.5	63.95-69.8	67.06	----
Lateral Line Scales	59-68	63.9	38-41	39.5	49-52	50.5	55.0
Scales above lateral line	10-13	10.9	7-8	7.5	8-9	8.5	70.6
Scales below lateral line	6-7	6.8	5-6	5.1	5-7	6.25	32.3
Caudal Peduncle Scales	10-12	11.2	7-9	8.0	10-11	10.25	29.7
Thousandths of Std. Length							
Head Length	258-284	274	245-273	253	262-282	271.5	11.9
Body Depth	202-235	216	92-274	231	234-256	247	206.7*
Preanal length	677-738	704	660-707	686	678-694	682.8	116.7*
Predorsal length	534-574	552	504-539	514	518-550	531.8	52
Pectoral Fin Length	170-229	197	140-177	160	173-198	184	34.5
Pelvic Fin Length	139-157	150	109-160	133	143-164	151.3	-7.4*
Dorsal Fin Base Length	101-115	107	97-128	116	114-117	116.3	102.8*
Thousandths of Head Length							
Head Depth	350-407	390	390-478	442	336-399	375.5	-27.9*
Snout length	305-337	321	250-304	275	287-311	302.8	39.7
Horizontal Eye Diameter	268-301	282	301-364	327	270-320	384.8	6.6

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